

**DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION**  
Interim Final 2/5/99  
**RCRA Corrective Action**  
**Environmental Indicator (EI) RCRIS code (CA725)**  
**Current Human Exposure Under Control**

Facility Name:	Hand Craft Cleaners (formerly)
Facility Address:	11401 Midlothian Turnpike, Midlothian, Virginia
Facility EPA ID #:	VAD 988169819

1. Has all available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

  X   If yes - check here and continue with #2 below.

       If no - re-evaluate existing data, or

       If data are not available skip to #6 and enter "IN" (more information needed) status code.

#### **BACKGROUND**

##### **Definition of Environmental Indicators (for the RCRA Corrective Action)**

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

##### **Definition of "Current Human Exposures Under Control" EI**

A positive "Current Human Exposures Under Control" EI determination ("YE" status code) indicates that there are no "unacceptable" human exposures to "contamination" (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

##### **Relationship of EI to Final Remedies**

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Current Human Exposures Under Control" EI are for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and do not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action program's overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

##### **Duration / Applicability of EI Determinations**

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

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2. Are groundwater, soil, surface water, sediments, or air media known or reasonably suspected to be “contaminated”<sup>a</sup> above appropriately protective risk-based “levels” (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

	Yes	No	?	Rationale / Key Contaminants
Groundwater	<u>X</u>	—	—	<u>PCE, TCE, cis-1,2-DCE, Vinyl Chloride, 1,1,1-TCA, 1,1,2-TCA, and 1,2-dichlorobenzene</u>
Air (indoors) <sup>b</sup>	—	<u>X</u>	—	—
Surface Soil (e.g., <2 ft)	—	<u>X</u>	—	—
Surface Water	—	<u>X</u>	—	—
Sediment	—	<u>X</u>	—	—
Subsurf. Soil (e.g., >2 ft)	—	<u>X</u>	—	—
Air (outdoors)	—	<u>X</u>	—	—

— If no (for all media) - skip to #6, and enter “YE,” status code after providing or citing appropriate “levels,” and referencing sufficient supporting documentation demonstrating that these “levels” are not exceeded.

X If yes (for any media) - continue after identifying key contaminants in each “contaminated” medium, citing appropriate “levels” (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.

— If unknown (for any media) - skip to #6 and enter “TN” status code.

### **Rationale:**

#### **Site Description and Activities**

The Hand Craft Cleaners property is located at 11401 Midlothian Turnpike in Chesterfield, Virginia (see attached site plan). The facility was operated as a dry cleaning and healthcare business using solvent tetrachloroethene (PCE) for nearly 32 years. In 1996 the property was closed. Both soil and groundwater (GW) were contaminated by PCE and its daughter products (TCE, cis-1,2-DCE, and Vinyl Chloride). Other contaminants included 1,2-dichlorobenzene, methylene chloride, 1,1,1-trichloroethane and 1,1,2-trichloroethane.

Closure activities were initiated with DEQ. A “Groundwater Monitoring Plan” was prepared October 1999 and revised November 2000, February 2001, and March 2001. Remediation of groundwater was initiated at the time of the closure activities for soil and is still ongoing at the facility. Groundwater samples have been collected quarterly at one background and three compliance wells since September 2001 and analyzed for the initial constituent of concern (tetrachloroethene) and its potential degradation products (“contaminants”). The resulting data are provided in the attached four (4) tables for PCE, TCE, cis-1,2-DCE, and Vinyl Chloride (VC) (unit: µg/l), respectively. PCE, TCE, cis-1,2-DCE and VC have had exceedances of their corresponding MCLs in one or more wells during the monitoring period. However, none of the contaminants currently exceed the MCLs. Methylene chloride, 1,1,1-

#### **Footnotes:**

<sup>a</sup> “Contamination” and “contaminated” describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriately protective risk-based “levels” (for the media, that identify risks within the acceptable risk range).

<sup>b</sup> Recent evidence (from the Colorado Dept. of Public Health and Environment, and others) suggest that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.



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trichloroethane and 1,1,2-trichloroethane were also monitored and had been detected in one or more wells groundwater in the past, but these constituents never exceeded their respective MCLs.

In 2002, the facility completed a RCRA Facility Assessment and excavated over 325 cubic yards of contaminated soil. On June 14, 2002, EPA issued a Facility Lead Agreement to Hand Craft for the investigation and remediation. On July 31, 2002 EPA and DEQ cosigned a "comfort letter" to Hand Craft assuring them that remediation of the soils had been completed. On January 6, 2003 clean closure (long-term residential exposure) for soil was approved by the Department.

Initial in-situ groundwater treatment was performed during closure activities at the site in 2001. As approved by DEQ, the facility injected permanganate solution into the saturated zone in order to oxidize any contaminants of concern that may reside within the saturated zone. Six injectors were constructed downgradient of the excavation trench (between the trench and three groundwater monitoring wells); three injectors were constructed immediately upgradient of the excavation trench (one outside the former building, two within the building before it was demolished).

Concentrations of constituents of concern remained below MCLs until rebound occurred in early 2003. In April 2004, a Pilot Study: GW Remediation - Proposed Work Plan was approved by the Department and sodium permanganate ( $\text{NaMnO}_4$ ) was injected at several locations into the uppermost aquifer to oxidize PCE and its daughter products (chlorinated ethenes) to  $\text{CO}_2$ ,  $\text{H}_2\text{O}$  and  $\text{Cl}^-$  (Chloride). Concentrations of PCE and its daughter products quickly decreased to below their respective MCLs. However, within two years the concentrations of the PCE and its daughter products rebounded again.

In August 2006, another injection of permanganate solution occurred at 52 locations at the facility. Contaminant concentrations have stayed below MCLs since that time.

Groundwater monitoring will continue at the facility under a recently (Nov 08) updated "*Groundwater Monitoring Plan*" for the next few years.

Based on risk evaluations at the time of soil closure as discussed in the closure report, no significant carcinogenic risk is attributed to inhalation of tetrachloroethene vapors derived from on-site soils.

### **References:**

General Theory, Principle and Application of Sodium Permanganate Oxidative Reactions (EPA, DOE, ITRC and etc.)

Draper Aden Associates. January, 2008. 11401 Midlothian Turnpike. Midlothian, Virginia. Groundwater Monitoring Program. Sampling Event 21: 12-27-07. Results of Sampling and Analysis. DAA Project No. 22153.30. EPA ID 988 169 819.

Groundwater Monitoring Plan for formerly Hand Craft Cleaners @ 11401 Midlothian Turnpike, Midlothian, Virginia

Soil Clean Closure Report, July 31, 2002

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3. Are there **complete pathways** between “contamination” and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table

<u>Contaminated Media</u>	<u>Potential Human Receptors (Under Current Conditions)</u>						
	Residents	Workers	Day-Care	Construction	Trespassers	Recreation	Food <sup>c</sup>
Groundwater	<u>No</u>	<u>No</u>	<u>No</u>	<u>No</u>	<u>No</u>	<u>No</u>	<u>No</u>
Air (indoors)							
Soil (surface, e.g., <2 ft)							
Surface Water							
Sediment							
Soil (subsurface e.g., >2 ft)							
Air (outdoors)							

Instructions for Summary Exposure Pathway Evaluation Table:

1. Strike-out specific Media including Human Receptors' spaces for Media which are not “contaminated”) as identified in #2 above.
2. Enter “yes” or “no” for potential “completeness” under each “Contaminated” Media – Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential “Contaminated” Media - Human Receptor combinations (Pathways) do not have check spaces (“\_\_\_”). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

  X   If no (pathways are not complete for any contaminated media-receptor combination) - skip to #6, and enter “YE” status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).

       If yes (pathways are complete for any “Contaminated” Media - Human Receptor combination) – continue after providing supporting explanation.

       If unknown (for any “Contaminated” Media - Human Receptor combination) - skip to #6 and enter “IN” status code

**Rationale:**

The groundwater monitoring system consists of one (1) background well (PZ-101), which is not an upgradient well relative to the SWMU (trench), and three (3) downgradient wells, MW-2, MW-3 and MW-4. Historically, the concentrations of the constituents of concern (COC) in the plume area have been decreasing over time, although there have been some rebounds. At present, the COCs in groundwater in the monitoring locations have stayed below MCLs. The plume is believed to have stabilized and to be decreasing. Also, there is no surface water body in the region where the facility is located. Thus, it is not expected for contaminated groundwater to discharge into any nearby surface water body. Additionally, the area is serviced by public water and sewer and there are no known drinking water wells in the area. The site and adjoining properties are covered by parking lots and buildings, and groundwater is 10 to 12 ft feet below surface.

The personnel involved with groundwater monitoring and remediation at the facility receive training in the following areas:

- ☐ Area specific management practices regarding post-closure care activities,
- X Security and safety,
- X General and area specific inspections and record keeping,
- ☐ Regulatory updates which affect operations and activities, and
- X Job function and procedural descriptions of each employee’s respective role in post-closure care.

<sup>c</sup> Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.)



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Currently, all personnel received 40-hour training in accordance with CFR 1910.120, and continue to receive 8-hour annual refresher classes, and medical monitoring (as warranted).

Therefore, human health exposure to contaminated groundwater is not a complete exposure pathway under current conditions.

Residents: Chesterfield provides water and sewer service to the Midlothian area. There are no known drinking water wells in the vicinity of the facility or within the facility boundary. The Hand Craft facility lies in a commercial area and the site and adjoining properties are covered by parking lots and buildings.

Workers and Construction Workers: Workers and contractors at the sites are protected from groundwater exposures as static water levels vary from 10 to 12 feet below the ground surface. Groundwater is not used on site, and workers' regular duties do not involve contact with ground water. Construction workers are covered under OSHA and are trained in using PPEs. There presently are no construction activities on-going or planned at the facility.

Trespassers: The Pier One store covers the original facility's footprint, and the groundwater monitoring wells are in the back of the building. Any trespassers to the back of the building are protected from groundwater exposures as static water levels vary from 10 to 12 feet below the ground surface. Each well has an expansion cap with padlock, and is located within a manhole having a lid with three bolts thus restricting access to trespassers.

Day-Care, Recreation, and Food: The Hand Craft Cleaners site is located in a commercial area and there are no known daycare services at the facility. The groundwater is not used for recreational purposes and is currently below MCLs. Food is not grown on-site, and there are no known residential wells that are used by neighboring communities to grow food.

**References:**

Draper Aden Associates. January, 2008. 11401 Midlothian Turnpike. Midlothian, Virginia. Groundwater Monitoring Program. Sampling Event 21: 12-27-07. Results of Sampling and Analysis. DAA Project No. 22153.30. EPA ID 988 169 819.

Tables of Historical Concentrations for the Contaminants (PCE and its potential degradation products) of Major Concerns (Attached)

Soil Clean Closure Report, July 31, 2002

4. Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be “**significant**”<sup>d</sup> (i.e., potentially “unacceptable” because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable “levels” (used to identify the “contamination”); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable “levels”) could result in greater than acceptable risks)?

\_\_\_\_\_ If no (exposures can not be reasonably expected to be significant (i.e., potentially “unacceptable”) for any complete exposure pathway) - skip to #6 and enter “YE” status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to “contamination” (identified in #3) are not expected to be “significant.”

\_\_\_\_\_ If yes (exposures could be reasonably expected to be “significant” (i.e., potentially “unacceptable”) for any complete exposure pathway) - continue after providing a description (of each potentially “unacceptable” exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to “contamination” (identified in #3) are not expected to be “significant.”

\_\_\_\_\_ If unknown (for any complete pathway) - skip to #6 and enter “IN” status code.

**Rationale and Reference(s):**

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<sup>d</sup> If there is any question on whether the identified exposures are “significant” (i.e. potentially “unacceptable”) consult a human health Risk Assessment specialist with appropriate education, training and experience.



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5. Can the “significant” exposures (identified in #4) be shown to be within **acceptable** limits?

\_\_\_\_\_ If yes (all “significant” exposures have been shown to be within acceptable limits) - continue and enter “YE” after summarizing and referencing documentation justifying why all “significant” exposures to “contamination” are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).

\_\_\_\_\_ If no (there are current exposures that can be reasonably expected to be “unacceptable”)- continue and enter “NO” status code after providing a description of each potentially “unacceptable” exposure.

\_\_\_\_\_ If unknown (for any potentially “unacceptable” exposure) - continue and enter “IN” status code.

**Rationale and Reference(s):**

<sup>4</sup> Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

<sup>5</sup> The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-systems.

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6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI event code 125 (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

  X   YE - Yes, "Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI Determination, "Current Human Exposures" are expected to be "Under Control" at the former Hand Craft Cleaners facility, EPA ID # AD988169819, located at 11401 Midlothian Turnpike, Midlothian, Virginia under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

\_\_\_ NO - "Current Human Exposures" are NOT "Under Control."

\_\_\_ IN - More information is needed to make a determination.

Completed by	(signature)		Date	06/30/2009
	(print)	Fuxing Zhou		
	(title)	Environmental Specialist II		
Supervisor	(signature)	<i>Leslie Romanchik</i>	Date	7/30/09
	(print)	Leslie Romanchik		
	(title)	Director, Office of Hazardous Waste		
	(EPA Region or State)			

**Locations where References may be found:**

Department of Environmental Quality  
Division of Hazardous Waste Permitting, Groundwater  
629 East Main Street  
Richmond, VA 23219

**Contact telephone and e-mail numbers:**

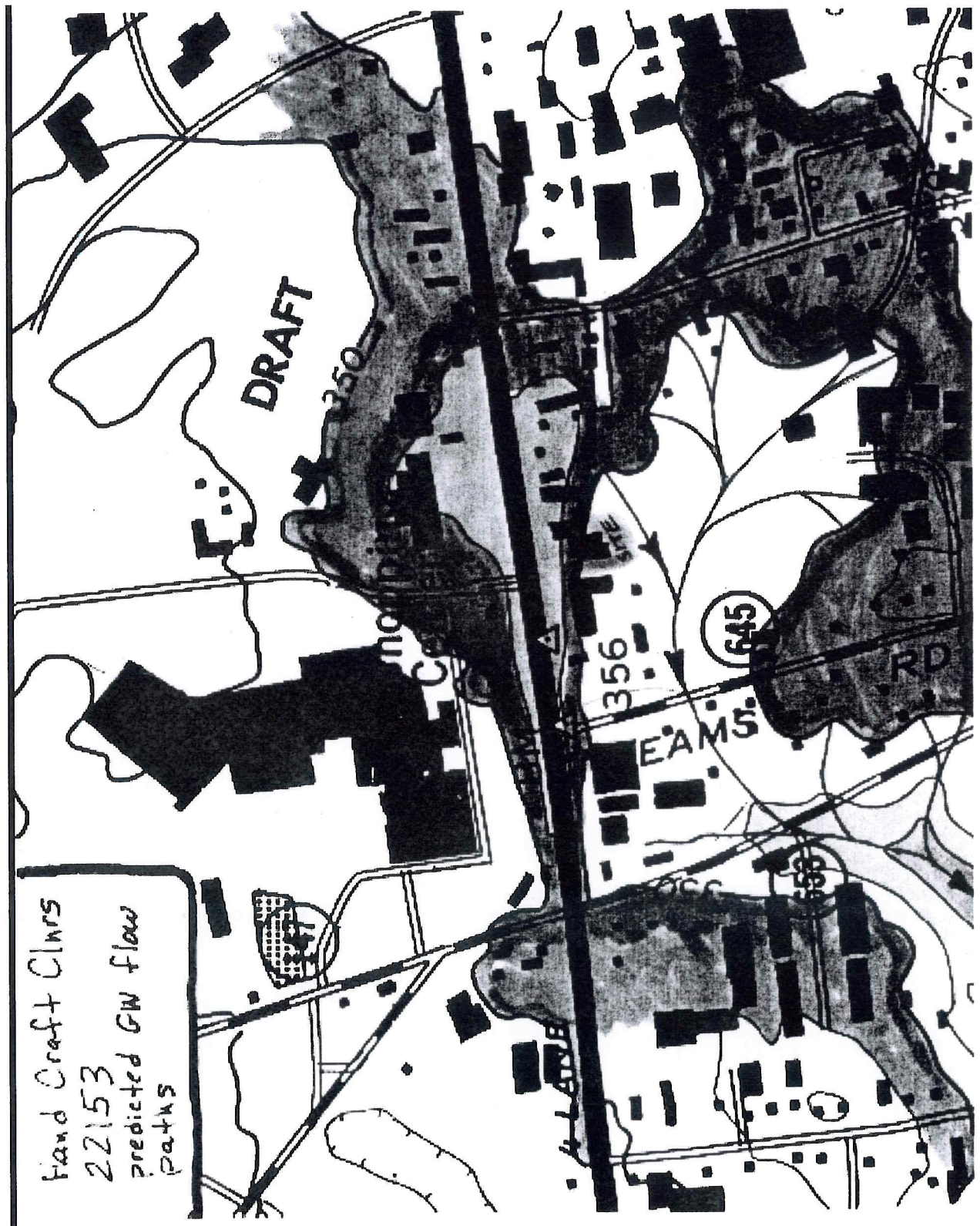
(name)	Fuxing Zhou
(phone #)	(804) 698-4126
(e-mail)	fzhou@deq.virginia.gov

Attachment 1: Site Maps

Attachment 2: Historical Data (Concentrations, Unit: µg/l) Tables

FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.









## HISTORY OF GROUNDWATER CHEMISTRY

CONSTITUENT	DATE	LABORATORY	MW-01	MW-02	MW-03	MW-04	PZ-101	LOO	LOQ	comment
date of well construction = 1,2-dichlorobenzene MCL = 600 ppb  excavation	13-Sep-01	Analytics	<0.17	<0.17	<0.17	<0.17		0.17	1	
	28-Feb-02	Analytics	<0.17	<0.17	<0.17	<0.17	<0.17	0.17	50	
	14-Apr-02	Analytics	<0.17	<0.17	<0.17	<0.17	<0.17	0.17	50	
	19-Jul-02	Analytics	<0.17	<0.17	<0.17	<0.17	<0.17	0.17	10	
	26-Mar-03	Air, Water, Soil	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	25-Jun-03	Air, Water, Soil	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	11-Oct-03	Air, Water, Soil	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	18-Jan-04	Air, Water, Soil	<0.2	<0.2	1.2	<0.2	<0.2	0.2	0.5	
	25-Apr-04	Air, Water, Soil	<0.2	<0.2	<0.5	<0.2	<0.2	0.2	0.5	
injection event March, 2004	25-May-04	Air, Water, Soil		<0.2	1.7	<0.2	<0.2	0.2	1.0	PCE only
	30-Jul-04	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	31-Oct-04	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	28-Jan-05	Air, Water, Soil		<0.2	1.6	<0.2	<0.2	0.2	1.0	
	21-May-05	Air, Water, Soil		<0.2	<1.0	<0.2	<0.2	0.2	1.0	
	7-Aug-05	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	3-Dec-05	Air, Water, Soil		<0.2	1.1	<0.2	<0.2	0.2	0.5	PCE only
	19-Jan-06	Air, Water, Soil						0.2	1.0	
	31-Mar-06	Air, Water, Soil					<0.2	0.2	0.5	
injection event August, 2006	31-Mar-06	Air, Water, Soil		<0.2	2.0	<0.2	<0.2	0.2	0.5	
	4-Sep-06	Air, Water, Soil		<0.2	1.0	<0.2	<0.2	0.2	0.5	
	27-Jan-07	Air, Water, Soil		<0.2	0.8	<0.2	<0.2	0.2	0.5	
	28-May-07	Air, Water, Soil		<0.5	1.0	<0.2	<0.2	0.2	0.5	
	20-Sep-07	Air, Water, Soil		<0.2	2.2	<0.2	<0.2	0.2	0.5	
	27-Dec-07	Air, Water, Soil		<0.2	3.4	<0.5	<0.2	0.2	0.5	
	24-Apr-08	Air, Water, Soil		<0.2	1.6	<0.2	<0.2	0.2	0.5	
	31-Jul-08	Air, Water, Soil		<0.2	0.7	<0.5	<0.2	0.2	0.5	
	31-Oct-08	Air, Water, Soil		<0.2	0.7	<0.5	<0.5	0.5	0.5	
average = standard deviation = coefficient of determination =	29-Apr-09	Air, Water, Soil		<0.4	<1.0	<0.4	<0.4	0.4	1.0	
					1.5 0.7 0.5					

CLIENT: HAND CRAFT CLEANERS AND LAUNDERERS, INC  
FACILITY: 11401 MIDLOTHIAN TURNPIKE  
PROJECT: GROUNDWATER MONITORING PROGRAM

HISTORY OF GROUNDWATER CHEMISTRY  
ORGANIC CONSTITUENTS

CONSTITUENT	DATE	LABORATORY	MW-01	MW-02	MW-03	MW-04	PZ-101	LOD	LOQ	comment
date of well construction = 1,1-dichloroethene MCL = 7 ppb	13-Sep-01	Analytics	<0.39	<0.39	<0.39	<0.39	<0.39	0.39	1	
	28-Feb-02	Analytics		<0.39	<0.39	<0.39	<0.39	0.39	50	
	14-Apr-02	Analytics		<0.39	<0.39	<0.39	<0.39	0.39	50	
	18-Jul-02	Analytics		<0.39	<0.39	<0.39	<0.39	0.39	10	
	26-Mar-03	Air, Water, Soil		<1.0	<1.0	<0.2	<0.2	0.2	1.0	
	25-Jun-03	Air, Water, Soil		1.3	<1.0	<1.0	<0.2	0.2	1.0	
	11-Oct-03	Air, Water, Soil		<1.0	1.3	<0.2	<0.2	0.2	1.0	
	18-Jan-04	Air, Water, Soil		4.3	3.5	5.5	<0.2	0.2	1.0	
Injection event March, 2004	25-Apr-04	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	25-May-04	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	PCE only
	30-Jul-04	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	31-Oct-04	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	28-Jan-05	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	21-May-05	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	7-Aug-05	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	3-Dec-05	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	19-Jan-06	Air, Water, Soil					<0.2	0.2	1.0	PCE only
	31-Mar-06	Air, Water, Soil					<0.2	0.2	1.0	
Injection event August, 2006	31-Mar-06	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	4-Sep-06	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	27-Jan-07	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	28-May-07	Air, Water, Soil		<1.0	<0.2	<0.2	<0.2	0.2	1.0	
	20-Sep-07	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	27-Dec-07	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	24-Apr-08	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	31-Jul-08	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	31-Oct-08	Air, Water, Soil		<1.0	<1.0	<1.0	<1.0	1.0	1.0	
	29-Apr-09	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
average =										
standard deviation =										
coefficient of determination =										
				2.8	2.4					
				1.5	1.1					
				0.5	0.5					



CLIENT: HAND CRAFT CLEANERS AND LAUNDERERS, INC

FACILITY: 11401 MIDLOTHIAN TURNPIKE

PROJECT: GROUNDWATER MONITORING PROGRAM

HISTORY OF GROUNDWATER CHEMISTRY  
ORGANIC CONSTITUENTS

CONSTITUENT	DATE	LABORATORY	MW-01 3-Apr-01	MW-02 3-Apr-01	MW-03 3-Apr-01	MW-04 3-Apr-01	PZ-101 3-Apr-01	LOD	LOQ	comment
date of well construction = ds-1, 2-dichloroethene MCL = 70 ppb	13-Sep-01	Analytics	<1	<1	<1	<1			1	
	28-Feb-02	Analytics		<0.26	<0.26	<0.26	<0.26	0.26	50	
	14-Apr-02	Analytics		<0.26	<0.26	<0.26	<0.26	0.26	50	
	18-Jul-02	Analytics		<0.26	<0.26	<0.26	<0.26	0.26	10	
	26-Mar-03	Air, Water, Soil		230	150	20	<0.2	0.2	0.5	
	25-Jan-03	Air, Water, Soil		300	160	62	<0.2	0.2	0.5	
	11-Oct-03	Air, Water, Soil		230	340	75	<0.2	0.2	0.5	
	18-Jan-04	Air, Water, Soil		510	680	1100	<0.2	0.2	0.5	
	25-Apr-04	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	25-May-04	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	PCE only
Injection event March, 2004	30-Jul-04	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	31-Oct-04	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	28-Jan-05	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	21-May-05	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	7-Aug-05	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	3-Dec-05	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	19-Jan-06	Air, Water, Soil						0.2	1.0	PCE only
	31-Mar-06	Air, Water, Soil					<0.2	0.2	0.5	
	31-Mar-06	Air, Water, Soil		<0.2	<0.2	11	<0.2	0.2	0.5	
	4-Sep-06	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
Injection event August, 2006	27-Jan-07	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	28-May-07	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	20-Sep-07	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	27-Dec-07	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	24-Apr-08	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	31-Jul-08	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	31-Oct-08	Air, Water, Soil		<0.5	<0.5	<0.5	<0.5	0.5	0.5	
	29-Apr-09	Air, Water, Soil		<0.4	<0.4	<0.4	<0.4	0.4	1.0	
average =			317.5	322.5	253.6					
standard deviation =			114.8	214.4	423.9					
coefficient of determination =			0.4	0.6	1.7					

CLIENT: HAND CRAFT CLEANERS AND LAUNDERERS, INC

FACILITY: 11401 MIDLOTHIAN TURNPIKE

PROJECT: GROUNDWATER MONITORING PROGRAM

HISTORY OF GROUNDWATER CHEMISTRY  
ORGANIC CONSTITUENTS

CONSTITUENT	DATE	LABORATORY	MW-01	MW-02	MW-03	MW-04	PZ-101	LOD	LOQ	comment
data of well construction =										
trans-1,2-dichloroethene	13-Sep-01	Analytics	<1	<1	<1	<1			1	
MCL = 100 ppb	28-Feb-02	Analytics		<0.27	<0.27	<0.27	<0.27	0.27	50	
	14-Apr-02	Analytics		<0.27	<0.27	<0.27	<0.27	0.27	50	
	18-Jul-02	Analytics		<0.27	<0.27	<0.27	<0.27	0.27	10	
	26-Mar-03	Air, Water, Soil		14	2.7	<0.2	<0.2	0.2	0.5	
	25-Jun-03	Air, Water, Soil		6.0	2.7	0.6	<0.2	0.2	0.5	
	11-Oct-03	Air, Water, Soil		4.6	5.2	1.8	<0.2	0.2	0.5	
	18-Jan-04	Air, Water, Soil		6.7	11	7.4	<0.2	0.2	0.5	
	25-Apr-04	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	25-May-04	Air, Water, Soil						0.2	1.0	PCE only
	30-Jul-04	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
Injection event March, 2004	31-Oct-04	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	28-Jan-05	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	21-May-05	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	7-Aug-05	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	3-Dec-05	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	19-Jan-06	Air, Water, Soil						0.2	1.0	PCE only
	31-Mar-06	Air, Water, Soil					<0.2	0.2	0.5	
	31-Mar-06	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	4-Sep-06	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	27-Jan-07	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
Injection event August, 2006	28-May-07	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	20-Sep-07	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	27-Dec-07	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	24-Apr-08	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	31-Jul-08	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	31-Oct-08	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	29-Apr-09	Air, Water, Soil		<0.5	<0.5	<0.5	<0.5	0.5	0.5	
				<0.4	<0.4	<0.4	<0.4	0.4	1.0	
average =										
standard deviation =										
coefficient of determination =										
				7.8	5.4	3.3				
				3.6	3.4	3.0				
				0.5	0.6	0.9				

## HISTORY OF GROUNDWATER CHEMISTRY

CONSTITUENT	DATE	LABORATORY	MW-01	MW-02	MW-03	MW-04	PZ-101	LOQ	comment
			3-Apr-01	3-Apr-01	3-Apr-01	3-Apr-01	3-Apr-01		
date of well construction = methylene chloride MMCL - 5 ppb	13-Sep-01	Analytics	<0.2	<0.2	<0.2	<0.2			
	28-Feb-02	Analytics		<0.2	<0.2	<0.2	<0.2	0.2	1
	14-Apr-02	Analytics		<0.2	<0.2	<0.2	<0.2	0.2	50
	18-Jul-02	Analytics		<0.2	<0.2	<0.2	<0.2	0.2	10
	26-Mar-03	Air, Water, Soil		<0.3	<0.3	<0.3	<0.3	0.3	1.0
	25-Jun-03	Air, Water, Soil		<0.3	<0.3	<0.3	<0.3	0.3	1.0
	11-Oct-03	Air, Water, Soil		<0.3	<0.3	<0.3	<0.3	0.3	1.0
	18-Jan-04	Air, Water, Soil		<0.3	<0.3	<0.3	<0.3	0.3	1.0
	25-Apr-04	Air, Water, Soil		<0.3	<0.3	<0.3	<0.3	0.3	1.0 t=0.7 J
Injection event March, 2004	25-May-04	Air, Water, Soil						0.2	PCE only
	30-Jul-04	Air, Water, Soil	1.7 B	<0.3	<0.3	2.1 B	<0.3	0.3	1.0 t=2.5, t=1.7
	31-Oct-04	Air, Water, Soil	<0.3	<0.3	<0.3	<0.3	<0.3	0.3	1.0
	28-Jan-05	Air, Water, Soil	<0.3	<0.3	<0.3	<0.3	<0.3	0.3	1.0 t=0.3 J
	21-May-05	Air, Water, Soil	<0.3	<0.3	<0.3	<0.3	<0.3	0.3	1.0
	7-Aug-05	Air, Water, Soil	1.8 B	0.8 B	0.8 B	1.2 B	1.6 B	0.3	1.0 t=0.4 J
	3-Dec-05	Air, Water, Soil	<0.3	<0.3	<0.3	<0.3	<0.3	0.3	1.0
	19-Jan-06	Air, Water, Soil							PCE only
	31-Mar-06	Air, Water, Soil					<1.0	0.2	1.0
	31-Mar-06	Air, Water, Soil		<1.0	<1.0	<1.0	<1.0	1.0	4.0
	4-Sep-06	Air, Water, Soil	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	4.0
	27-Jan-07	Air, Water, Soil	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	4.0
	28-May-07	Air, Water, Soil	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	4.0
	20-Sep-07	Air, Water, Soil	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	4.0
	27-Dec-07	Air, Water, Soil	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	4.0
	24-Apr-08	Air, Water, Soil	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	4.0
	31-Jul-08	Air, Water, Soil	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	4.0
31-Oct-08	Air, Water, Soil	<4.0	<4.0	<4.0	<4.0	<4.0	4.0	4.0	
23-Apr-09	Air, Water, Soil	<4.0	<4.0	<4.0	<4.0	<4.0	1.0	4.0	
average =									
standard deviation =									
coefficient of determination =									



## HISTORY OF GROUNDWATER CHEMISTRY

[illegible]

## HISTORY OF GROUNDWATER CHEMISTRY

### ORGANIC CONSTITUENTS

average =  
standard deviation =  
coefficient of determination =

CLIENT: HAND CRAFT CLEANERS AND LAUNDERERS, INC  
 FACILITY: 11401 MIDLOTHIAN TURNPIKE  
 PROJECT: GROUNDWATER MONITORING PROGRAM

HISTORY OF GROUNDWATER CHEMISTRY  
 ORGANIC CONSTITUENTS

CONSTITUENT	DATE	LABORATORY	MW-01	MW-02	MW-03	MW-04	PZ-101	LOD	LOQ	comment
Trichloroethene MCL = 5 ppb	13-Sep-01	Analytics	<0.29	<0.29	<0.29	<0.29	<0.29	0.29	1	
	28-Feb-02	Analytics		<0.29	<0.29	<0.29	<0.29	0.29	50	
	14-Apr-02	Analytics		<0.29	<0.29	<0.29	<0.29	0.29	50	
	18-Jul-02	Analytics		<0.29	<0.29	<0.29	<0.29	0.29	10	
	26-Mar-03	Air, Water, Soil		56	140	21	<0.2	0.2	1.0	
	25-Jun-03	Air, Water, Soil		58	110	8	<0.2	0.2	1.0	
	11-Oct-03	Air, Water, Soil		27	130	44	<0.2	0.2	1.0	
	18-Jan-04	Air, Water, Soil		70	660	150	<0.2	0.2	1.0	
	25-Apr-04	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	25-May-04	Air, Water, Soil								PCE only
Injection event March, 2004	30-Jul-04	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	31-Oct-04	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	28-Jan-05	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	21-May-05	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	7-Aug-05	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	3-Dec-05	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	19-Jan-06	Air, Water, Soil								PCE only
	31-Mar-06	Air, Water, Soil					<0.2	0.2	1.0	
	31-Mar-06	Air, Water, Soil		<0.2	<0.2	30	<0.2	0.2	1.0	
	4-Sep-06	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
Injection event August, 2006	27-Jan-07	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	28-May-07	Air, Water, Soil		<1.0	<0.2	<0.2	<0.2	0.2	1.0	
	20-Sep-07	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	27-Dec-07	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	24-Apr-08	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	31-Jul-08	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	31-Oct-08	Air, Water, Soil		<1.0	<1.0	<1.0	<1.0	1.0	1.0	
	29-Apr-09	Air, Water, Soil		<1.0	<0.2	<0.2	<0.2	0.2	1.0	
average =			52.8	260.0	50.5					
standard deviation =			15.8	231.2	51.1					
coefficient of determination =			0.3	0.9	1.0					



## HISTORY OF GROUNDWATER CHEMISTRY

### ORGANIC CONSTITUENTS

CONSTITUENT	DATE	LABORATORY	MW-01	MW-02	MW-03	MW-04	PZ-101	LOD	LOQ	comment
state of well construction = detrachloroethene MCL = 5 ppb	13-Sep-01	Analytics	<0.31	<0.31	<0.31	<0.31		0.31	1	
	28-Feb-02	Analytics	<0.31	<0.31	<0.31	<0.31	<0.31	0.31	50	
	14-Apr-02	Analytics	<0.31	<0.31	<0.31	<0.31	<0.31	0.31	50	
	19-Jul-02	Analytics	<0.31	<0.31	<0.31	<0.31	<0.31	0.31	10	
	26-Mar-03	Air, Water, Soil	38	550	70		<0.2	0.2	1.0	
	25-Jun-03	Air, Water, Soil	57	660	36		<0.2	0.2	1.0	
	11-Oct-03	Air, Water, Soil	33	140	200		<0.2	0.2	1.0	
	18-Jan-04	Air, Water, Soil	110	3500	330		<0.2	0.2	1.0	
	25-Apr-04	Air, Water, Soil	85	<0.2	<0.2		<0.2	0.2	1.0	
	25-May-04	Air, Water, Soil	<0.2	<0.2	<0.2		<0.2	0.2	1.0	
	30-Jul-04	Air, Water, Soil	<0.2	<0.2	<0.2		<0.2	0.2	1.0	
Injection event March, 2004	31-Oct-04	Air, Water, Soil	1.6	<0.2	<0.2		<0.2	0.2	1.0	
	28-Jan-05	Air, Water, Soil	<0.2	<0.2	<0.2		<0.2	0.2	1.0	
	21-May-05	Air, Water, Soil	<0.2	<0.2	<0.2		<0.2	0.2	1.0	
	7-Aug-05	Air, Water, Soil	<0.2	<0.2	<0.2		<0.2	0.2	1.0	
	3-Dec-05	Air, Water, Soil	<0.2	<0.2	<0.2		<1.0	0.2	1.0	verification
	19-Jan-06	Air, Water, Soil					<0.2	0.2	1.0	
	31-Mar-06	Air, Water, Soil	5.1	0.5	25		<0.2	0.2	1.0	
	31-Mar-06	Air, Water, Soil	<0.2	<0.2	<0.2		<0.2	0.2	1.0	
	4-Sep-06	Air, Water, Soil	<0.2	<0.2	<0.2		<0.2	0.2	1.0	
	27-Jan-07	Air, Water, Soil	<0.2	<0.2	<0.2		<0.2	0.2	1.0	
	28-May-07	Air, Water, Soil	<1.0	<0.2	<0.2		<0.2	0.2	1.0	
Injection event August, 2006	20-Sep-07	Air, Water, Soil	<0.2	<0.2	<0.2		<0.2	0.2	1.0	
	27-Dec-07	Air, Water, Soil	<0.2	<0.2	<0.2		<0.2	0.2	1.0	
	24-Apr-08	Air, Water, Soil	<0.2	<0.2	<0.2		<0.2	0.2	1.0	
	31-Jul-08	Air, Water, Soil	<0.2	<0.2	<0.2		<0.2	0.2	1.0	
	31-Oct-08	Air, Water, Soil	<1.0	<1.0	<1.0		<1.0	1.0	1.0	
	28-Apr-09	Air, Water, Soil	<1.0	<0.2	<0.2		<0.2	0.2	1.0	
average =			47.1	970.1	132.2					
standard deviation =			37.0	1288.6	116.9					
coefficient of determination =			0.8	1.3	0.9					

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FACILITY: 11401 MIDLOTHIAN TURNPIKE  
PROJECT: GROUNDWATER MONITORING PROGRAM

HISTORY OF GROUNDWATER CHEMISTRY  
ORGANIC CONSTITUENTS

CONSTITUENT	LABORATORY	DATE	MW-01	MW-02	MW-03	MW-04	PZ-101	LOD	LOQ	comment
date of well construction =										
vinyl chloride MCL = 2 ppb	Analytics	13-Sep-01	<0.51	<0.51	<0.51	<0.51	<0.51	0.51	1	
	Analytics	28-Feb-02		<0.51	<0.51	<0.51	<0.51	0.51	50	
	Analytics	14-Apr-02		<0.51	<0.51	<0.51	<0.51	0.51	50	
	Analytics	18-Jul-02		<0.51	<0.51	<0.51	<0.51	0.51	10	
	Air, Water, Soil	26-Mar-03		16	7.0	3.6	<0.2	0.2	1.0	
	Air, Water, Soil	25-Jan-03		24	6.1	10	<0.2	0.2	1.0	
	Air, Water, Soil	11-Oct-03		4.3	16	1.6	<0.2	0.2	1.0	
	Air, Water, Soil	18-Jan-04		5.3	36	69	<1	0.2	1.0	
	Air, Water, Soil	25-Apr-04		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
Injection event March, 2004	Air, Water, Soil	25-May-04						0.2	1.0	PCE only
	Air, Water, Soil	30-Jul-04		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	Air, Water, Soil	31-Oct-04		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	Air, Water, Soil	28-Jan-05		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	Air, Water, Soil	21-May-05		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	Air, Water, Soil	7-Aug-05		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	Air, Water, Soil	3-Dec-05		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	Air, Water, Soil	19-Jan-06						0.2	1.0	PCE only
	Air, Water, Soil	31-Mar-06					<0.2	0.2	1.0	
	Air, Water, Soil	31-Mar-06		<0.2	<0.2	0.7	<0.2	0.2	1.0	
	Air, Water, Soil	4-Sep-06		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	Air, Water, Soil	27-Jan-07		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	Air, Water, Soil	28-May-07		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	Air, Water, Soil	20-Sep-07		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	Air, Water, Soil	27-Dec-07		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	Air, Water, Soil	24-Apr-08		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
Injection event August, 2006	Air, Water, Soil	31-Jul-08		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	Air, Water, Soil	31-Oct-08		<1.0	<1.0	<1.0	<1.0	1.0	1.0	
	Air, Water, Soil	29-Apr-09		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
average =										
standard deviation =										
coefficient of determination =										
			12.4	16.3	17.0					
			8.1	12.0	26.2					
			0.65	0.74	1.54					

CLIENT: HAND CRAFT CLEANERS AND LAUNDERERS, INC  
 FACILITY: 11401 MIDLOTHIAN TURNPIKE  
 PROJECT: GROUNDWATER MONITORING PROGRAM

HISTORY OF GROUNDWATER CHEMISTRY  
 ORGANIC CONSTITUENTS

CONSTITUENT	DATE	LABORATORY	MW-01	MW-02	MW-03	MW-04	PZ-101	LOD	LOQ	comment
date of well construction =										
<p>All results in µg/l unless noted.          Bolded / blue values indicate a concentration that exceeded the FSAC.          Upgradient well not shaded.</p> <p>IS - analysis concentration associated with blank contamination          R - analysis concentration unavailable          - additional Appendix 5.1 constituent          - found in instrument blank          1 - found in field blank          CC - continuing calibration beyond limits          ee - surrogate spikes beyond limits          ar - sample result less than 5X IDL          d - duplicate analysis beyond limits          cf - correlation coefficient beyond limits</p> <p>QL - laboratory reporting limit          GWPS - groundwater protection standards          SPL - statistical prediction limits</p> <p>J - analysis concentration estimated          ♦ - MCL / GWPS not established          1 - found in trip blank          8 - found in air blank          ic - initial calibration beyond limits          is - internal standard beyond limits          e - found in the equipment blank          ms - matrix spikes beyond limits          lc - LCS sample beyond limits          shaded cells - no data          8 - data value is considered a statistical outlier</p> <p>MCL - maximum contamination limit          FSAC - facility background          ACL - alternate contamination limit</p>										
	3-Apr-01		3-Apr-01	3-Apr-01	3-Apr-01	3-Apr-01	3-Apr-01			